Environmental Resources Management

3352 128th Avenue Holland, MI 49424-9263 (616) 399-3500 (616) 399-3777 (fax) http://www.erm.com



9 January 2019

Reference: 0455217.0142

Mr. Tim Benton Weston Solutions, Inc. 1090 King George Post Road Suite 201 Edison, NJ 08837

Re: Whole Effluent Toxicity Test Results

Dear Tim:

Enclosed please find the final results of the following Chronic Toxicity Test performed on samples of the Tonawanda Coke Corporation Outfall 004 effluent.

- 13 December 2018, Chronic Ceriodaphnia dubia Toxicity Test
- 13 December 2018, Chronic Pimephales promelas Toxicity Test

If you have any questions concerning this report or if I can be of any further assistance to you, please feel free to contact me at (616) 738-7308 or via e-mail at bruce.rabe@erm.com.

Sincerely,

Bruce A. Rabe

Director, Aquatic Toxicology Laboratory

Bru G. Rabe

BAR:km

Enclosures: Whole Effluent Toxicity Test Report

cc: File

FINAL REPORT

Chronic Toxicity Test Freshwater Invertebrate, *Ceriodaphnia dubia* EPA Test Method 1002.0

Submitted To:
Weston Solutions, Inc.
1090 King George Post Road
Suite 201
Edison, New Jersey 08837

Sample: Tonawanda Coke Corp. - Outfall 004

Testing Period: 13 – 20 December 2018

Laboratory I.D. Number: 121318-9



Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424



121318-9 Cd Page 1 of 24

Test Overview



Permittee: Tonawanda Coke Corporation

Location: 3875 River Road

Tonawanda, New York 14150

Contact: Robert Kuberka Telephone #: 716.876.6222

SPDES Permit #: NY0002399

Permit Requirements: Acute Toxicity Limit = 0.3 TUa

Chronic Toxicity Limit = 1.0 TUc

Test Sample: Outfall 004
Receiving Water: Niagra River

Testing Date: 13 – 20 December 2018

Sample Dates 12 December 2018

14 December 201817 December 2018

Test/Method: Daphnid, Ceriodaphnia dubia,

Survival and Reproduction Test EPA 821-R-02-013 Method

1002.0.

QC Objectives: Test data met all test

acceptability criteria, except

where noted below.

Data Qualifiers: See Case Narrative.

DATA SUMMARY

Effluent Concentrations	Survival (%)	Reproduction (Average Young/Female)
Lab Control	100	20.7
Upstream Control	100	21.0
6	100	22.8
13	100	21.1
25	100	20.4
50	100	18.2
100	90	16.6

TEST RESULTS

48-Hour LC ₅₀	>100%
NOEC	100%
LOEC	>100%
IC ₂₅	>100%
MSDp (Reproduction)	31.6%
TUa (100/LC ₅₀)	0.3
TUc (100 / NOEC)	1.0

TEST CONCLUSION

In accordance with the SPDES permit requirements for Tonawanda Coke Corp., this toxicity test did not exhibit either acute or chronic toxicity.

Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0455217.0142

Bom G. Rela

Environmental Resources Management 3352 128th Avenue Holland, Michigan 49424-9263 Phone: 616.399.3500

Phone: 616.399.3500 Fax: 616.399.3777



ERM Testing Method

Ceriodaphnia dubia – Survival and Reproduction Toxicity Test

Upon sample receipt, the effluent and receiving water samples were visually inspected for indigenous organisms and analysed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, samples were filtered through a 60 micron (µm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius (°C) until needed for testing.

A series of five effluent concentrations and two controls (dilution control and laboratory control) were established for testing. Effluent concentrations were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of receiving water. The control solutions consisted of 100 percent receiving water and 100 percent reconstituted moderately hard water.

Ceriodaphnia dubia used to initiate this test were obtained from individual, in-house cultures and were less than 24-hours old, and had an age range of 0 to 8 hours at test initiation. Test organisms used to initiate this test were released from adults which met acceptable performance criteria (i.e., ≥15 young/surviving female within 3 broods and obtained from a brood of at least 8 young) and were maintained in reconstituted moderately hard water prior to test initiation.

The *Ceriodaphnia dubia* test was conducted using 30-milliliter (mL) disposable polystyrene containers containing 15 mL of control water or test solution. One *Ceriodaphnia dubia* was added to each test chamber with ten replicate chambers per treatment. Each *Ceriodaphnia dubia* test chamber was fed a 0.2-mL suspension consisting of yeast-Cerophyll-trout chow (YCT) and green algae (*Raphidocelis subcapitata*) mixture daily.





The test solutions were renewed daily during the exposure by transferring the adult daphnid, by way of a wide bore pipette, into fresh control water or test solution.

Percent survival of exposed *Ceriodaphnia dubia* was determined by inspecting for adult mortality daily. Mortality was defined as no body or appendage movement after gentle prodding. Production of young was also determined by daily inspections and enumeration. When 60 percent of the surviving females in the control treatment produced three broods, mean reproduction was determined by calculating the average number of live young produced per female for each treatment.

The test was conducted at a temperature of 25 ± 1 °C under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentrations (NOEC) and Lowest Observed Effect Concentrations (LOEC) were determined for Ceriodaphnia dubia survival and reproduction, and a 25 percent Inhibition Concentration (IC₂₅) was determined for Ceriodaphnia dubia reproduction. An NOEC is defined as the highest effluent concentration that does not produce any observed adverse effect to the exposed test organism. An LOEC is defined as the lowest effluent concentration that does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration. Significant differences in Ceriodaphnia dubia survival were determined using the Fisher's Exact Test.

Prior to the determination of any significant differences in *Ceriodaphnia dubia* reproduction, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test. For reporting purposes, a chronic toxic unit (TUc) is calculated and is defined as the most conservative of either 100/NOEC based on the more sensitive test endpoint or 100/IC₂₅.

To evaluate acute toxicity, a 48-hour LC₅₀ and corresponding 95 percent confidence interval was also calculated, where possible. If the LC₅₀ calculation was not possible (e.g. greater than 50 percent survival) then the 100 percent effluent response was compared to the control for a statistical difference (e.g. T-Test). The LC₅₀ value estimate was determined by using one of the following statistical methods: graphical, Spearman-Karber, Trimmed Spearman-Karber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 48-hour LC₅₀ value was converted to an acute toxic unit (TUa) by 100/LC₅₀. For 48-hour LC₅₀ values greater than 100 percent in which there is a statistical difference between the control and 100 percent effluent, the TUa is reported as 1.0 TUa. In cases where there is no statistical difference between the control and 100 percent effluent, the TUa is reported as 0.3 TUa. All statistical analyses were performed using the CETISTM Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms and the precision of the testing procedure. Chronic reference toxicant tests are performed at least monthly and the resulting IC_{25} are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC_{25} of a particular reference toxicant test does not fall within the expected range of \pm two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall

credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative





The quality control results achieved laboratory specifications.

2.0 MODIFICATIONS TO ERM'S STANDARD TEST METHOD

Test was performed in accordance with ERM's standard test method (see page 3).

3.0 DATA QUALIFIERS

Due to shipping issues which caused delay in the receipt of the third effluent sample, sample 2 was used for test renewals beyond the 72-hour holding time limit.

Appendix A Supporting Documents

- Raw Test Data
- Statistical Analysis (if necessary)
- Chain-of-Custody Forms
- Standard Reference Toxicant Data

/ironmental Resources Management

Ceriodaphnia dubia - Chronic Toxicity Test **Initial Water Quality and Test Solution Preparation**

Table 1 Page 1 of 1

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

121318-9

Beginning Date: **Ending Date:**

12/13/18

Time: 1700

Time: 1200

Control/Dilution Water:

Organism Batch #:

Organism Age:

14-19 hours

QC Review:

QC Review Date:

KM 12/21/18

RMHW

231-18

Initial Water Quality:

Parameter	Units		Effluent		Upstrean	Receiving	y Water	Synthetic Water		
Sample #		1	2	3	1	2	3		======	
Lab I.D.#/ Batch #		121348-9	121518-7	12-1918-2	121318-41	£	_	97-18) « 	
Temperature	° C	2	(2	3	-				
Dissolved Oxygen	mg/L	13.2	12.8	13.8	13.7		-		77	
pН	3.U.	1.3	6.8	6.8	76		William .	7.8	-	
Conductivity	umhos/cm	407	452	467	326		_	332	-	
Alkalinity	mg / L CaCO ₃	120	94	120	120			60	-	
Hardness	mg / L CaCO ₃	120	120	120	100	-	-	88	, printing,	
Total Ammonia	mg / L NH ₃	0,4	0.4	3,2	0.1	·				
Total Residual Chlorine	mg / L Cl ₂	10.01	10.01	40N	20.01			20.01	~	
Total mls of Sodium		11-24		1						
Thiosulfate added	mg / L						-			
per liter		- 201						<u> </u>		
Initials		my	CM	mi	pry	e		MS	-	

Test Solution Preparation:

Test Colution Frepara	CIOTII.	The second section is	Variety Community	A-1-1-11	arr -	(1 - N - N - N	
Treatment	Effluent	Dilution	Test		Upstream	Effluent	Synthetic
(% Effluent)	(mL)	(mL)	Day	Initials	Sample #	Sample #	Batch #
Lab Control	0	1200	0	an	1	(97-18
Control - Upstream	0	1200	1	Rmm	1	1	97-18
6%	72	1128	2	Pru		V	97-18
13%	156	1044	3	Pen	-	2	97-18
25%	300	900	4	w	l	2_	97-10
50%	600	600	5	pm	1	2	97-18
100%	1200	0	6	ms	1	3	97-18
			7	SPR			

Environmental Resources Management

Ceriodaphnia dubia - Chronic Toxicity Test Water Quality Data

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location: Lab I.D.#: Outfall 004 (21318-9

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(% Effluent)		F	1	F		E	- 11	F		F		F	ıl	F
Lab Control	8.3	7.7	8.3	73	8/3	729	815	83		8.2	811	72	8.2	8,0
Control - Upstream	8,4	78	8.6	OCE	84	728	86	82	fo)	8-1	874	7-1	8-)	8:1
6%	8.4	7.8	8.3	400	84	-1.8	86	814	Fb	8.2	841	71	8-0	8,1
13%	8,4	48	8.4	71	8rlf	80	86	gru	8-7	8-3	guy	74	80	41
25%	4.5	4-4	8.4	7.2	8.4	8.0	828	84	80)	8.3	83	71	8.0	6,0
50%	8,5	80	8.4	41	8.4	80	Ela	83	87	8.3	83	7-1	7.9	7.9
100%	4.5	80	8.4	73	85	8.0	86	814	81	8,3	ষ্ঠাও	21	7.7	200
							pH (\$		-			,		
						· ·	Da				12	4		-
Meter#	8	8	8	8	8	8	8	0		10	10	8	3	7
Treatment	0		1	- 2			3		4		5	F	,	F
(% Effluent)		F	- A	F		F		F	2 4	F	18		7.8	7.0
Lab Control	7.8	4,8	7.9	7.8	99	7.8	8.0	811	7.8	7.9		34		
Control - Upstream	76	8.0	7.9	80	7.9	7.9	7.9		7,4	7.9	7.3	76	7.6	7.5
6%		80		80		80		82		8.0		7.7		10
13%		8-1		8.1		800		82		8.0		78		70
25%		8.1		852		8.		82		8.1		79		1
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Treatment	0	F	1		291	F	 	F		F	Ī	F	Ĭ	F
(% Effluent)		_	329		324		324	307	329		331	332	328	<u> </u>
Lab Control	300		529		327	_	355		334	10 220		334	331	
Control - Upstream	329		221		338		345		339		350	342	140	
6%	334		356				345	775-	278		363		353	-
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25%	35		253		362		393		364		398		409	
50%	320		373		396		455		345		461		181	
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Lab Control	24	24	14	M	25	24	w	24	24	24	25	24	24	24
Control - Upstream	W	14	24	W	24	114	25	24	24	24	25	W	25	21
6%	W	w	24	W	w	24	25	w	MY	24	25	111	20	2
13%	111	w	24	74	24	24	25	24	24	ay	25	W	Lin	2
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Note: D.O. meter also used for temperature measurement unless otherwise noted.

Ceriodaphnia dubia - Chronic Toxicity Test Survival and Reproduction Data

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

121318-9

Treatment	Day				KM a	Replic	ate					Average Young/	Number of Live Adults	Averag Young Femal
(% Effluent)	No.	1	2	3	4	5	6	7	8	9	10	Female	(%)	% C\
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	2										-	1	10	
	3		Approx		-	_	,-		-		-	1	10	
Lab Control	4	-3	5	6	5	5	6	5	5	3	2		10	
	5	ens.	9	10	3-	9	9	7	10	9	7		10	
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Control - Upstream	4	7	6	5	6	6	8	-3	6	3	12		10	15.30
	5	3	9	11	5	8	9	-2	8	10	14	1 3	10	
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atala:	7		6(1)	11	16	19	27	5(2)	25	24	29	21.0	(100)	31.4
otals:		3	3	27	3	3	3	3	3	3	3	(t00)	(100)	713
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												16.6	(90)	40.

(E) ≃ ABORTED EMBRYOS /EGGS

(1) = ONE DEAD YOUNG

(S) = SPLIT BROOD

* = 4th BROOD EXCLUDED FROM TOTAL

Environmental Resources Management

Ceriodaphnia dubia - Chronic Toxicity Test Support Data

Table 3 Page 2 of 2

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

121318-9

Brood	Roard	Information:	
Brood	Board	miormation.	

Blood Board Interna	3117							_				E 200 100 100 100 100 100 100 100 100 100
Renlicate	1	2	3	4	5	6	7	8	9	10	Brood Board Date:	105/18
Chamber Number	31	51	U	1	5	35	55	40	20	10	Young Age Range:	14-19 hours

Test Information:

andy

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
YCT Batch #:	Derch	21-18	21-18	418	21-18	21-18	21-18	(max.
Algae Batch #:	79-18	29.18	3018	30-18	30-18	30-18	3018	-
Observation Time:	1200	1300	1400	1130	1430	1530	1300	1200
Initials:	en	M.	GM,	OM	pri	KM	M	SPR
Date:	12/13/18	12/14/18	12/5/18	12/16/18	12/19/18	12/18/18	12/19/18	17/20/16

Comment Section:

Day ,	Date	Initials	Comments
o rend	12/13/18	M	Upstream receiving water sample used as diluent
			
	-		

Report Date: Test Code/ID: 21 Dec-18 13:07 (p 1 of 2) 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d	Survival and	Reproduc	ction Te	st									ERM
	2545-3117 Dec-18 13:07		•		urvival Rat 2xK Contir	e ngency Tabl	es		TIS Ver		CETISv1	1.9.4	
Batch ID: 15-	7376-1715	Test	Туре:	Repr	oduction-S	urvival (7d)		An	alyst:	Lab	Tech		
Start Date: 13	Dec-18 12:00	Prof	ocol:	EPA/	821/R-02-	013 (2002)		Dil	uent:	Rece	eiving Wate	er	
Ending Date: 20	Dec-18 12:00	Spe	cies:	Cerio	daphnia d	ubia		Br	ine:				
Test Length: 7d	0h	Taxe	on:	Brane	chiopoda			So	urce:	In-H	ouse Cultu	re	Age: <2
Sample ID: 11-	0083-3427	Cod	e:	419D	6293			Pre	oject:	WET	Г Complian	ce Testing	
Sample Date: 12	Dec-18 09:25	Mat	erial:	Indus	strial Efflue	nt		So	urce:	Tona	awanda Co	ke Corp.	
Receipt Date: 13	Dec-18 10:00	CAS	(PC):					Sta	ation:	Outf	all 004		
Sample Age: 27h	ı (2 °C)	Clie	nt:	Tona	wanda Co	ke Corp.							
Data Transform		Alt Hyp						NOEL	LOE	L	TOEL	TU	
Untransformed		C > T						100	>100)	n/a	1	
Fisher Exact/Bon	ferroni-Holm	Test				,							
Control vs	Group		Test S	Stat	P-Type	P-Value	Decision	(a:5%)					
Upstream Contr	6		1.0000		Exact	1.0000	-	ificant Effe					
	13		1.0000		Exact	1.0000		ificant Effe					
	25		1.0000		Exact	1.0000	_	ificant Effe					
	50		1.0000		Exact	1.0000	-	ificant Effe					
	100		0.5000)	Exact	1.0000	Non-Sign	ificant Effe	ect			·····	
Test Acceptability	/ Criteria	TAC L	imits										
Attribute	Test Stat	Lower	Upper		Overlap	Decision							
Control Resp	1	0.8	>>		Yes	Passes C	riteria ————						
Data Summary													
Conc-%	Code	NR	R		NR + R	Prop NR	Prop R	%Effec	t				
0	U	10	0		10	1	0	0.0%					
6		10	0		10	1	0	0.0%					
13		10	0		10	1	0	0.0%					
25		10	0		10	1	0	0.0%					
50		10	0		10	1	0	0.0%					
100		9	1		10	0.9	0.1	10.0%					
7d Survival Rate	Detail												
Conc-%	Code	Rep 1	Rep 2		Rep 3	Rep 4	Rep 5	Rep 6	Rep		Rep 8	Rep 9	Rep 10
0	U	1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.00		1.0000	1.0000	1.0000
6		1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.00		1.0000	1.0000	1.0000
13		1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.00		1.0000	1.0000	1.0000
25		1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.00		1.0000	1.0000	1.0000
50		1.0000	1.0000		1.0000	1.0000	1.0000	1.0000	1.00		1.0000	1.0000	1.0000
100		1.0000	1.0000)	1.0000	1.0000	1.0000	1.0000	1.00	00	0.0000	1.0000	1.0000
7d Survival Rate	Binomials												
Conc-%	Code	Rep 1	Rep 2		Rep 3	Rep 4	Rep 5	Rep 6	Rep	7	Rep 8	Rep 9	Rep 10
0	U	1/1	1/1		1/1	1/1	1/1	1/1	1/1		1/1	1/1	1/1
6		1/1	1/1		1/1	1/1	1/1	1/1	1/1		1/1	1/1	1/1
13		1/1	1/1		1/1	1/1	1/1	1/1	1/1		1/1	1/1	1/1
25		1/1	1/1		1/1	1/1	1/1	1/1	1/1		1/1	1/1	1/1
50		1/1	1/1		1/1	1/1	1/1	1/1	1/1		1/1	1/1	1/1
100		1/1	1/1		1/1	1/1	1/1	1/1	1/1		0/1	1/1	1/1

Report Date: Test Code/ID: 21 Dec-18 13:07 (p 2 of 2)

2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analyzed:

Analysis ID: 15-2545-3117 21 Dec-18 13:07

Analysis:

Endpoint: 7d Survival Rate

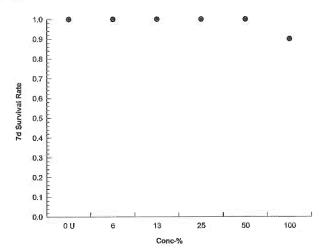
STP 2xK Contingency Tables

CETIS Version:

CETISv1.9.4

Status Level:

Graphics



Report Date: Test Code/ID: 21 Dec-18 13:08 (p 1 of 2) 2F32FC1 / 00-4949-1905

Ceriodaphnia	1)-u Julviva	and Repre	Addition 10.			_								
Analysis ID: Analyzed:	03-7025-788 21 Dec-18 1			Reproduction Parametric-Co	ntrol vs T	reat	ments		S Versions S Level		CETISv1.	9.4		
Batch ID:	15-7376-171	5	Test Type:	Reproduction-S	Survival (7	⁷ d)		Anal	yst:	Lab Te	ech			
Start Date:	13 Dec-18 1	2:00	Protocol:	EPA/821/R-02-	013 (200	2)		Dilue	ent: F	Recei				
Ending Date:	20 Dec-18 1	2:00	Species:	Ceriodaphnia d	lubia			Brine	e :					
Test Length:			Taxon:	Branchiopoda				Sour	ce: I	In-Hou	ise Culture		Age: <2	
Sample ID:	11-0083-342	27	Code:	419D6293				Proje			Complianc	-		
Sample Date:	12 Dec-18 0	9:25	Material:	Industrial Efflu	ent			Sour			/anda Cok	e Corp.		
Receipt Date:	: 13 Dec-18 1	0:00	CAS (PC):					Stati	on: (Outfal	004			
Sample Age:	27h (2 °C)		Client:	Tonawanda Co	ke Corp.									
Data Transfo	rm	Alt H	/p					NOEL	LOEL		TOEL	TU	PMSD	
Untransforme	d	C>T						100	>100		n/a	1	31.62%	
Dunnett Mult	iple Compari	son Test												
Control	vs Cond	-%	Test S	tat Critical	MSD		P-Type	P-Value	Decisi					
Upstream Cor	ntr 6		-0.620		6.64		CDF	0.9559		_	ant Effect			
	13		-0.068		6.64		CDF	0.8530		_	ant Effect			
	25		0.2069		6.64	-	CDF	0.7647		-	ant Effect			
	50		0.9653		6.64		CDF	0.4323		-	ant Effect			
	100		1.517	2.289	6.64	18	CDF	0.2116	Non-S	Signific	ant Effect			
Test Accepta	bility Criteria	TA	C Limits											
Attribute	Test S	tat Lowe	r Upper	Overlap	Decisi	on								
Control Resp	21	15	>>	Yes	Passes	Cr	iteria							
ANOVA Table)													
Source	Sum S	Squares	Mean	Square	DF		F Stat	P-Value	Decis					
Between	252.33	33	50.466	7	5		1.2	0.3218	Non-S	ignific	ant Effect			
Error	2271.0	3	42.066	7	54		_							
Total	2523.9	93			59									
Distributiona	l Tests													
Attribute	Test				Test S	tat	Critical	P-Value	Decis	ion(α	1%)			
Variances	Bartle	tt Equality o	f Variance T	est	4.395		15.09	0.4941	Equal	Varia	nces			
Distribution	Shapi	o-Wilk W N	ormality Tes	t	0.9699		0.9459	0.1451	Norma	al Dist	ribution			
Reproduction	n Summary													
	Code	Coun			050/ 11	CI	Median	Min	Max		Std Err	CV%	%Effect	
Conc-%				95% LCL		96					2.087	31.43%	0.00%	
	U	10	21	16.28	25.72	OL	22.5	10	29					
0		10 10	21 22.8	16.28 16.47	25.72 29.13	OL.	22.5 24.5	1	33		2.796	38.78%	-8.57%	
0 6 13		10 10 10	21 22.8 21.2	16.28 16.47 16.99	25.72 29.13 25.41	OL.	22.5 24.5 22.5	1 13	33 30		2.796 1.861	27.76%	-0.95%	
0 6 13 25		10 10 10 10	21 22.8 21.2 20.4	16.28 16.47 16.99 17.13	25.72 29.13 25.41 23.67		22.5 24.5 22.5 20	1 13 13	33 30 30		2.796 1.861 1.447	27.76% 22.43%	-0.95% 2.86%	
0 6 13 25 50		10 10 10 10 10	21 22.8 21.2 20.4 18.2	16.28 16.47 16.99 17.13 14.3	25.72 29.13 25.41 23.67 22.1	<u>or</u>	22.5 24.5 22.5 20 20	1 13 13 8	33 30 30 27		2.796 1.861 1.447 1.724	27.76% 22.43% 29.96%	-0.95% 2.86% 13.33%	
0 6 13 25 50		10 10 10 10	21 22.8 21.2 20.4	16.28 16.47 16.99 17.13	25.72 29.13 25.41 23.67		22.5 24.5 22.5 20	1 13 13	33 30 30		2.796 1.861 1.447	27.76% 22.43%	-0.95% 2.86%	
0 6 13 25 50 100	U n Detail	10 10 10 10 10 10	21 22.8 21.2 20.4 18.2 16.6	16.28 16.47 16.99 17.13 14.3 11.78	25.72 29.13 25.41 23.67 22.1 21.42		22.5 24.5 22.5 20 20 16	1 13 13 8 9	33 30 30 27 30		2.796 1.861 1.447 1.724 2.13	27.76% 22.43% 29.96% 40.58%	-0.95% 2.86% 13.33% 20.95%	
0 6 13 25 50 100 Reproduction Conc-%	U n Detail Code	10 10 10 10 10 10	21 22.8 21.2 20.4 18.2 16.6	16.28 16.47 16.99 17.13 14.3 11.78	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4		22.5 24.5 22.5 20 20 16	1 13 13 8 9	33 30 30 27 30 Rep 7	7	2.796 1.861 1.447 1.724 2.13	27.76% 22.43% 29.96% 40.58% Rep 9	-0.95% 2.86% 13.33% 20.95%	
0 6 13 25 50 100 Reproduction Conc-%	U n Detail	10 10 10 10 10 10 10	21 22.8 21.2 20.4 18.2 16.6 Rep 2	16.28 16.47 16.99 17.13 14.3 11.78	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4		22.5 24.5 22.5 20 20 16 Rep 5	1 13 13 8 9 Rep 6	33 30 30 27 30 Rep 7	7	2.796 1.861 1.447 1.724 2.13 Rep 8	27.76% 22.43% 29.96% 40.58% Rep 9	-0.95% 2.86% 13.33% 20.95% Rep 10	
0 6 13 25 50 100 Reproduction Conc-% 0 6	U n Detail Code	10 10 10 10 10 10 10	21 22.8 21.2 20.4 18.2 16.6 Rep 2 21	16.28 16.47 16.99 17.13 14.3 11.78 Rep 3	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4		22.5 24.5 22.5 20 20 16 Rep 5 19	1 13 13 8 9 Rep 6 27 25	33 30 30 27 30 Rep 7	7	2.796 1.861 1.447 1.724 2.13 Rep 8 25 33	27.76% 22.43% 29.96% 40.58% Rep 9 24 31	-0.95% 2.86% 13.33% 20.95% Rep 10 29 27	
0 6 13 25 50 100 Reproduction Conc-% 0 6	U n Detail Code	10 10 10 10 10 10 10 10 12 26 30	21 22.8 21.2 20.4 18.2 16.6 Rep 2 21 24 23	16.28 16.47 16.99 17.13 14.3 11.78 Rep 3 27 22	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4 16 1		22.5 24.5 22.5 20 20 16 Rep 5 19 19	1 13 13 8 9 Rep 6 27 25 24	33 30 30 27 30 Rep 7 10 20	7	2.796 1.861 1.447 1.724 2.13 Rep 8 25 33 28	27.76% 22.43% 29.96% 40.58% Rep 9 24 31 21	-0.95% 2.86% 13.33% 20.95% Rep 10 29 27 22	
0 6 13 25 50 100 Reproduction Conc-% 0 6 13	U n Detail Code	10 10 10 10 10 10 10 10 26 30 23	21 22.8 21.2 20.4 18.2 16.6 Rep 2 21 24 23 22	16.28 16.47 16.99 17.13 14.3 11.78 Rep 3 27 22 13 18	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4 16 1 13		22.5 24.5 22.5 20 20 16 Rep 5 19 19 23	1 13 13 8 9 Rep 6 27 25 24 18	33 30 30 27 30 Rep 7 10 20 15 21	7	2.796 1.861 1.447 1.724 2.13 Rep 8 25 33 28 30	27.76% 22.43% 29.96% 40.58% Rep 9 24 31 21	-0.95% 2.86% 13.33% 20.95% Rep 10 29 27 22 23	
Conc-% 0 6 13 25 50 100 Reproduction Conc-% 0 6 13 25 50	U n Detail Code	10 10 10 10 10 10 10 10 12 26 30	21 22.8 21.2 20.4 18.2 16.6 Rep 2 21 24 23	16.28 16.47 16.99 17.13 14.3 11.78 Rep 3 27 22	25.72 29.13 25.41 23.67 22.1 21.42 Rep 4 16 1		22.5 24.5 22.5 20 20 16 Rep 5 19 19	1 13 13 8 9 Rep 6 27 25 24	33 30 30 27 30 Rep 7 10 20	7	2.796 1.861 1.447 1.724 2.13 Rep 8 25 33 28	27.76% 22.43% 29.96% 40.58% Rep 9 24 31 21	-0.95% 2.86% 13.33% 20.95% Rep 10 29 27 22	

Report Date: Test Code/ID: 21 Dec-18 13:08 (p 2 of 2) 2F32FC1 / 00-4949-1905

Ceriodaphnia 7-d Survival and Reproduction Test

ERM

Analyzed:

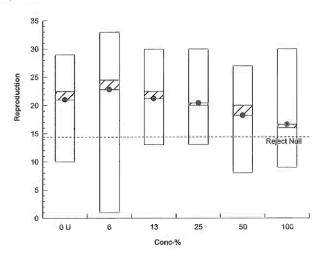
Analysis ID: 03-7025-7884 21 Dec-18 13:07 Endpoint: Reproduction Analysis:

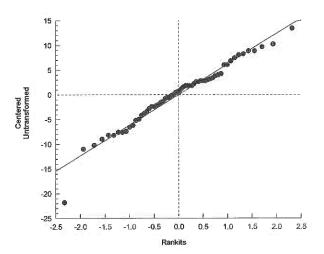
Parametric-Control vs Treatments

CETIS Version: Status Level:

CETISv1.9.4

Graphics





Report Date: Test Code/ID: 21 Dec-18 13:08 (p 1 of 2) 2F32FC1 / 00-4949-1905

Ceriod	aphnia	7-d Survival and	d Reproduc	tion Te	est							ERM
Analysi Analyz		09-5940-8788 21 Dec-18 13:07		point: lysis:	Reproduction Linear Interpola	ation (ICPIN)		TIS Version tus Level:	: CETISv 1	1.9.4	
Batch I	D:	15-7376-1715	Test	Туре:	Reproduction-S	Survival (7d)		Ana	alyst: Lai	Tech		
Start D	ate:	13 Dec-18 12:00	Prot	ocol:	EPA/821/R-02-	013 (2002)		Dile	uent: Re	ceiving Wat	er	
Ending	Date:	20 Dec-18 12:00	Spe	cies:	Ceriodaphnia d	ubia		Bri	ne:			
Test Le	ngth:	7d 0h	Taxe	on:	Branchiopoda		•	Soi	urce: In-	House Cultu	ıre	Age: <24
Sample	D:	11-0083-3427	Cod	e:	419D6293			Pro	ject: Wi	ET Complia	nce Testing	
Sample	Date:	12 Dec-18 09:25	Mate	erial:	Industrial Efflue	ent		So	urce: To	nawanda Co	oke Corp.	
Receip	t Date:	13 Dec-18 10:00	CAS	(PC):				Sta	tion: Ou	tfall 004		
Sample	Age:	27h (2 °C)	Clie	nt:	Tonawanda Co	ke Corp.						
Linear	Interpo	lation Options									110000	
X Trans	form	Y Transform	See	d	Resamples	Exp 95%	CL Met	hod				
Log(X+	1)	Linear	2125	5587	200	Yes	Two	-Point Inter	polation			
Test Ac	ceptab	oility Criteria	TACL							·, ····		
Attribu	-	Test Stat	TAC Li Lower	Uppe	r Overlap	Decision						
Control		21	15	>>	Yes	Passes C	riteria					
Point E				-								
Level	sumac %	95% LCL	95% UCL	TU	95% LCL	95% UCL						
C5	18.01		58.88	5.554		95.29						
C10	31.12		n/a	3.214		31.25						
C15	43.91		n/a	2.277		9.347						
IC20	67.19		n/a	1.488		5.425						
C25	>100	n/a	n/a	<1	n/a	n/a						
IC40	>100	n/a	n/a	<1	n/a	n/a						
IC50	>100	n/a	n/a	<1	n/a	n/a						
Renroc	luction	Summary				Cal	culated Va	ariate			Isotor	nic Variate
Conc-%		Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect		Mean	%Effect
0		U	10	21	10	29	6.6	31.43%	0.0%		21.9	0.0%
6			10	22.8	1	33	8.842	38.78%	-8.57%		21.9	0.0%
13			10	21.2	13	30	5.884	27.76%	-0.95%		21.2	3.2%
25			10	20.4	13	30	4.575	22.43%	2.86%		20.4	6.85%
50			10	18.2	8	27	5.453	29.96%	13.33%		18.2	16.89%
100			10	16.6	9	30	6.736	40.58%	20.95%		16.6	24.2%
Reprod	luction	Detail										
Conc-%	6	Code	Rep 1	Rep 2	Rep 3	Rep 4	Rep 5	Rep 6	Rep 7	Rep 8	Rep 9	Rep 10
0	-	U	12	21	27	16	19	27	10	25	24	29
6			26	24	22	1	19	25	20	33	31	27
			30	23	13	13	23	24	15	28	21	22
13												
			23	22	18	13	17	18	21	30	19	23
13 25 50			23 22	22 20	18 21	13 8	17 16	18 21	21 13	30 27	19 14	23 20

Report Date: Test Code/ID: 21 Dec-18 13:08 (p 2 of 2)

Ceriodaphnia 7-d Survival and Reproduction Test

2F32FC1 / 00-4949-1905

Analyzed:

Analysis ID: 09-5940-8788 21 Dec-18 13:07 Endpoint: Reproduction Analysis:

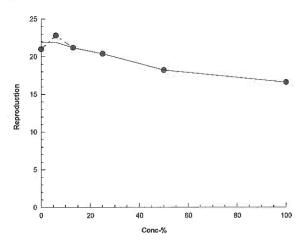
Linear Interpolation (ICPIN)

CETIS Version:

CETISv1.9.4

Status Level:

Graphics



USEPA

DateShipped: 12/12/2018

CarrierName: FedEx

Lab#

CHAIN OF CUSTODY RECORD

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132004-0013

Lab: Environmental Resources

Lab Phone: 616-399-3500

Lab QC Z Preservative None 10 L Nalgene Numb Container Sample Time 09:25 12/12/2018 Sample Date Matrix Water Chronic Toxicity Test Analyses OF4-01-181212-01 | OUTFALL 4 Location 5-81512 AirbilNo: 773951939200 407 Mary A # aldmeS

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY#

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

Sample Condition Upon Receipt Date/Times. Received by (Signature and Organization) 1500 Date/Time 12/12/18 Relinquished by (Signature and Organization) WESTON Items/Reason / Semple

USEPA

DateShipped: 12/14/2018

CarrierName: FedEx

AirbillNo: 773975881367

CHAIN OF CUSTODY RECORD

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121418-114000-0018

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Lab#	Sample #	Location	Analyses	Matrix	Sample Date	Sample	Numb	Numb Container Cont	Preservative Lab QC	Lab QC
	OF4-02-181214-01 OUTFALL 4	OUTFALL 4	Chronic Toxicity Test	Water	12/14/2018	08:25	_	10 L Nalgene	4 C	z
	No. 1									
		4-818/21								
		DW: 100								
		towe :								
		725 Km								
		- Committee of the Comm								
								=		

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com 48 Hour Prelim Results, Two weeks written. Email Results to

CHAIN OF CUSTODY #

SAMPLES TRANSFERRED FROM

Items/Reason	Items/Reason Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/Sample	WESTON	क्षड्रा विष्युष	Fulex		/
			Collow Roge Hoten	(2/18/18 100	Cold
			3,0	<i>y</i>	

DateShipped: 12/17/2018 USEPA

CarrierName: FedEx

AirbillNo: 77399646440

CHAIN OF CUSTODY RECORD

Case #:

Contact Phone: (732) 585-4425 Contact Name: Tim Benton

No: 2-121718-114628-0019

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

0F4-03-181217-01 OUTFALL 4 Chronic Tox Z 9 2 2 2 2 2 2 2 2 2	Chronic Toxicity Test	Water	12/17/2018	11:40	*	ACT MILITARE		
\$ 35,42						I IO L Naigerie	4 C	Z
8 30,42								
200,42								
200,42								
30,42								
442								
42								
2								

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013 Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com 48 Hour Prelim Results, Two weeks written. Email Results to

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY#

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Date/Time Sample Condition Upon Receipt
Bamble	MESTON	17/13/18	Facx		1
			Colleur Rose/ten	0501 81/6/21	* oot of huld three
					Feder Baron from

01/8/2121

CHAIN OF CUSTODY RECORD

DateShipped: 12/12/2018

Page 1 of 1 USEPA AirbillNo: 773951939439

CarrierName: FedEx

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132541-0014

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Preservative Lab QC None 1 10 L Naigene Numb Container Cont Sample Time 10:40 12/12/2018 Sample Date Matrix Water Analyses None NIAGARA RIVER 121318 Location OUNID 05 IT RW-01-181212 # 200 Sample # Lab#

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/sugle	Leston	oasi plulu	Ren Krown	8/6/2	
			- All Control of the		

|2 13 18 - 18 11 12 13 CHAIN OF CUSTODY RECORD

DateShipped: 12/12/2018

Page 1 of 1 USEPA

AirbillNo: 773951939987 CarrierName: FedEx

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132710-0015

Lab: Environmental Resources

Lab Phone: 616-399-3500

Preservative Lab QC None 1 10 L Nalgene Numb Container Cont Sample Time 10:41 12/12/2018 Sample Date Matrix Water Analyses None NIAGARA RIVER Location RW-02-181212 Sample # Lab#

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

				Dodge France	Paralla Candition I land Docoint
Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/ IIIIe	Sample Condition opon Receipt
1 Sande	Wares	12/14/8 1500	May 1824	000)	

121318 - K12 = 12/13

DateShipped: 12/12/2018

Page 1 of 1 USEPA

AirbillNo: 773951940270 CarrierName: FedEx

Contact Name: Tim Benton

No: 2-121218-132805-0016

Management

Lab Phone: 616-399-3500

Lab: Environmental Resources

Contact Phone: (732) 585-4425

Preservative Lab QC	None									
Numb Container Cont	10 L Nalgene									
Cont	T									
Sample	10:41									
Sample Date	12/12/2018								W	
Matrix	Water									
Analyses	None		and the second s				A STATE OF THE STA			
Location	NIAGARA RIVER									
Sample #	RW-03-181212									
Lab#										

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Date/Time Sample Condition Upon Receipt
Sample	MESTON	12/19/19	and four	3/15/18	

121318-12/13 Plus

Page 1 of 1

USEPA DateShinned: 12/12/20

DateShipped: 12/12/2018

CarrierName: FedEx

AirbillNo: 773951940215

CHAIN OF CUSTODY RECORD

Case #.

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

raioo

No: 2-121218-132857-0017

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Lab QC	Z									
Preservative Lab QC	None									
Numb Container Cont	10 L Nalgene									
Numb	1									
Sample Time	10:43									
Sample	12/12/2018					Į.				
Matrix	Water									
70										
Analyses	None									
Location	NIAGARA RIVER									
Sample #	RW-04-181212									
Lab#										

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to Tim.Benton@WestonSolutions.com Tim.Benton@WestonSolutions.com

CHAIN OF CUSTODY #

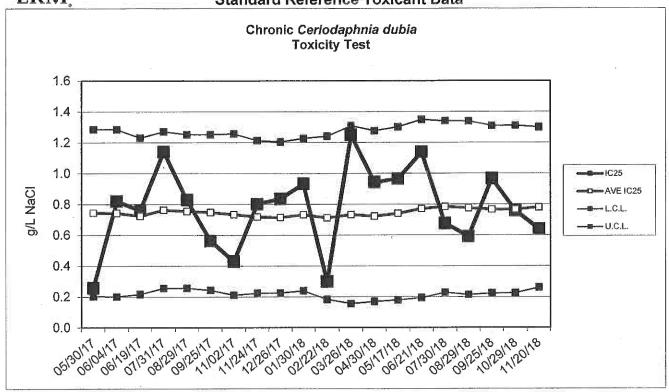
SAMPLES TRANSFERRED FROM

Date/Time Sample Condition Upon Receipt		
Date/Time	1000	
Received by (Signature and Organization)	Ch May	
Date/Time	य गिर्माङ	
Relinquished by (Signature and Organization)	T T WESTON	
Items/Reason	1/simple	



Environmental Resources Management

Standard Reference Toxicant Data



Chronic Ceriodanhnia dubia Toxicity Test Da	-

Date	IC25 (g/L NaCl)	AVE IC25		OL LIMIT Upper	Survival (%)	CONTROL Reproduction (ave. young)	CV (%)
		,					
04/12/17	0.40	0.8	0.3	1.3	100	34.4	16.8
05/30/17	0.26	0.7	0.2	1.3	100	34.4	12.5
06/04/17	0.82	0.7	0.2	1.3	90	31.0	22.6
06/19/17	0.76	0.7	0.2	1.2	100	28.8	9.2
07/31/17	1.14	0.8	0.3	1.3	100	31.2	17.3
08/29/17	0.83	0.8	0.3	1.3	100	29.7	18.0
09/25/17	0.56	0.7	0.2	1.3	» 100	25.5	17.1
11/02/17	0.43	0.7	0.2	1.3	100	28.0	11.8
11/24/17	0.80	0.7	0.2	1.2	100	21.0	37.4
12/26/17	0.83	0.7	0.2	1.2	100	21.9	11.9
01/30/18	0.93	0.7	0.2	1.2	100	25.5	36.3
02/22/18	0.30	0.7	0.2	1.2	100	17.8	35.0
03/26/18	1.25	0.7	0.2	1.3	90	32.5	38.5
04/30/18	0.94	0.7	0.2	1.3	100	32.0	25.5
05/17/18	0.97	0.7	0.2	1.3	100	30.0	38.6
06/21/18	1.14	0.8	0.2	1.3	80	35.2	8.2
07/30/18	0.68	0.8	0.2	1.3	100	25.5	16.3
08/29/18	0.59	0.8	0.2	1.3	100	30.1	26.2
09/25/18	0.97	0.8	0.2	1.3	100	27.6	26.7
10/29/18	0.76	0.8	0.2	1.3	100	32.7	24.8
11/20/18	0.64	0.8	0.3	1.3	100	34.8	15.2

FINAL REPORT

Chronic Toxicity Test Freshwater Vertebrate, *Pimephales promelas* EPA Test Method 1000.0

Submitted To:
Weston Solutions, Inc.
1090 King George Post Road
Suite 201
Edison, New Jersey 08837

Sample: Tonawanda Coke Corp. - Outfall 004

Testing Period: 13 – 20 December 2018

Laboratory I.D. Number: 121318-9



Conducted By:
Environmental Resources Management, Inc.
3352 128th Avenue
Holland, Michigan 49424



Test Overview



Permittee: Tonawanda Coke Corporation

Location: 3875 River Road

Tonawanda, New York 14150

Contact: Robert Kuberka Telephone #: 716.876.6222

SPDES Permit #: NY0002399

Permit Requirements: Acute Toxicity Limit = 0.3 TUa

Chronic Toxicity Limit = 1.0 TUc

Test Sample: Outfall 004
Receiving Water: Niagra River

Testing Date: 13 – 20 December 2018

Sample Dates 12 December 2018

14 December 201817 December 2018

Test/Method: Fathead Minnow,

Pimephales promelas, Survival and Growth Test EPA 821-R-

02-013 Method 1000.0.

QC Objectives: Test data met all test

acceptability criteria, except

where noted below.

Data Qualifiers: See Case Narrative.

DATA SUMMARY

Effluent	Survival	Growth
Concentrations (%)	(%)	Average Wt./ Organism (mg)
Lab Control	87.5	0.572
Upstream Control	95	0.597
6	95	0.619
13	100	0.582
25	97.5	0.586
50	100	0.625
100	97.5	0.603

TEST RESULTS

96-Hour LC ₅₀	>100%
NOEC	100%
LOEC	>100%
IC ₂₅	>100%
MSDp (Reproduction)	22.0%
TUa (100 / LC ₅₀)	0.3
TUc(100/NOEC)	1.0

TEST CONCLUSION

In accordance with the SPDES permit requirements for Tonawanda Coke Corp., this toxicity test did not exhibit either acute or chronic toxicity.

Bruce A. Rabe
Director, Aquatic
Toxicology Laboratory
ERM Project No. 0455217.0142

Bonn G. Role

Environmental Resources Management 3352 128th Avenue Holland, Michigan 49424-9263 Phone: 616.399.3500

Fax: 616.399.3777



ERM Testing Method

Pimephales promelas – Survival and Growth Toxicity Test

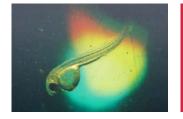
Upon sample receipt, the effluent and receiving water samples were visually inspected for indigenous organisms and analysed for a suite of water quality parameters (Appendix A - Table 1). Where indigenous organisms were present, samples were filtered through a 60 micron (µm) NITEX® screen. All samples were maintained at 0 – 6 degrees Celsius (°C) until needed for testing.

A series of five effluent concentrations and two controls (dilution control and laboratory control) were established for testing. Effluent concentrations were prepared by mixing appropriate volumes of dilution water and effluent in the test containers. Dilution water consisted of receiving water. The control solutions consisted of 100 percent receiving water and 100 percent reconstituted moderately hard water.

Pimephales promelas used to initiate this test were obtained from in-house cultures and were less than 24-hours old at test initiation. Test organisms were maintained in reconstituted moderately hard water prior to test initiation.

The Pimephales promelas test was conducted using 300 to 500-milliliter (mL) disposable polypropylene containers containing 250 mL of control water or test solution. Ten fish were randomly added to each test chamber with four replicate chambers per treatment. Each Pimephales promelas test chamber was fed 0.1 mL of a concentrated suspension of less than 24-hour old live brine shrimp nauplii (Artemia sp.) two times per day. Test solutions were renewed daily during the exposure by replacing approximately 90 percent of the 24-hour old solution with fresh control water or appropriate test solution. Prior to test solution renewal, uneaten and dead brine shrimp, along with other debris, were removed from the bottom of the test chambers.

Percent survival of exposed *Pimephales promelas* was determined daily by enumeration of live organisms. Mortality was defined as no body movement after





gentle prodding. At the termination of the chronic test, larvae in each test chamber were counted, dried, and weighed to the nearest 0.01 milligram (mg) on an analytical balance.

The test was conducted at a temperature of 25 ± 1 °C under fluorescent lighting with a photoperiod of 16 hours light and 8 hours dark. Water quality measurements were performed on all control and test solutions prior to test initiation and on selected treatments daily thereafter, as indicated in the raw data (Appendix A - Table 2).

Following termination of the chronic toxicity test, No Observed Effect Concentration (NOEC) and Lowest Observed Effect Concentration (LOEC) were determined for both *Pimephales promelas* survival and growth and a 25 percent Inhibition Concentration (IC₂₅) was determined for *Pimephales promelas* growth. The NOEC is defined as the highest effluent concentration which does not produce any observed adverse effect to the exposed test organism whereas the LOEC is defined as the lowest effluent concentration which does produce an observed adverse effect to the exposed test organism. An adverse effect is determined as a statistically significant difference between the control and a given effluent concentration.

Prior to the determination of any significant differences in *Pimephales promelas* survival and growth, the data were evaluated for normal distribution and homogeneity characteristics. Depending on the result and the number of test replicates per concentration, an analysis of variance test was performed, followed by one of the following mean comparison tests: Dunnett's Procedure, Bonferroni t-Test, Steel's Many-One Rank Test, Wilcoxon Rank Sum Test, or the T-Test. For reporting purposes, a chronic toxic unit (TUc) is calculated and is defined as the most conservative of either 100/NOEC based on the most sensitive test endpoint or 100/IC₂₅.

To evaluate acute toxicity, a 48-hour LC₅₀ and corresponding 95 percent confidence interval was also calculated, where possible. If the LC₅₀ calculation was not possible (e.g. greater than 50 percent survival) then the 100 percent effluent response was compared to the control for a statistical difference (e.g. T-Test). The LC₅₀ value estimate was determined by using one of the following statistical methods: graphical, Spearman-Karber, Trimmed Spearman-Karber, or Probit. The method selected for reporting test results was determined by the characteristics of the data; that is, the presence or absence of 0 and 100 percent mortality and the number of concentrations in which mortalities between 0 and 100 percent occurred. For reporting purposes, the 48-hour LC₅₀ value was converted to an acute toxic unit (TUa) by 100/LC₅₀. For 48-hour LC₅₀ values greater than 100 percent in which there is a statistical difference between the control and 100 percent effluent, the TUa is reported as 1.0 TUa. In cases where there is no statistical difference between the control and 100 percent effluent, the TUa is reported as 0.3 TUa. All statistical analyses were performed using the CETIS™ Version 1.9.4.3 software program.

The reference toxicant, sodium chloride, was used to monitor the sensitivity of the test organisms. Chronic reference toxicant tests are performed at least monthly and the resulting IC₂₅ are plotted to determine if the results are within prescribed limits (Appendix A - Standard Reference Toxicant Data). If the IC₂₅ of a particular reference toxicant test does not fall within the expected range of \pm two standard deviations from the mean for a given test organism, the sensitivity of that organism and the overall credibility of the test system is suspect.

Reference:

USEPA. 2002. Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms, 4th Ed. U.S. Environmental Protection Agency, Office of Water, Washington, D.C., EPA-821-R-02-013.

Case Narrative





1.0 TEST PERFORMANCE CRITERIA

The quality control results achieved laboratory specifications.

2.0 **MODIFICATIONS TO ERM'S** STANDARD TEST METHOD

Test was performed in accordance with ERM's standard test method (see page 3)

3.0 DATA QUALIFIERS

Due to shipping issues which caused delay in the receipt of the third effluent sample, sample 2 was used for test renewals beyond the 72-hour holding time limit.

Appendix A Supporting Documents

- Raw Test Data
- Statistical Analysis (if necessary)
- Chain-of-Custody Forms
- Standard Reference Toxicant Data

Environmental Resources Wanagement

Pimephales promelas - Chronic Toxicity Test Initial Water Quality and Test Solution Preparation

Table 1 Page 1 of 1

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

Beginning Date: **Ending Date:**

121318-9 12/20/18

Time: 1100 Time: 1100 Control/Dilution Water:

Organism Batch #:

Organism Age:

QC Review:

QC Review Date:

RMHW

206-18 s

12/21/18

Initial Water Quality:

Parameter	Units		Effluent		Upstrea	m Receiving	Water	Synthetic	Water
Sample #		1	2	3	1	2	3	Manipage 3	-
Lab I.D.#/ Batch #		121318-9	121518-7	121918-2	121318-14		1	97-18	
Temperature	° C ôlf-	12/20/12	1	2	3	-	gaine		
рН		73 4-2	6.813-8	+36.4	76137	Plants,	1	7.8	-
Conductivity		4077-3	45240-8		2676	-	-	332	-
Alkalinity	mg / L CaCO ₃		98450	120	120 526	-		60	- franch
Hardness	mg / L CaCO ₃	120	120	120	100	1	_	PP	
Total Ammonia	mg / L NH ₃	0,0	0,8	3,2	6,1	-	-	-	
Total Residual Chlorine	mg / L Cl ₂	60.01	20,01	2010	40.01	-	ł	400	
Total mls of Sodium Thiosulfate added per liter	mg / L		_	-	-	_			
per mer Initials		CM	SPR	SPR	con	٠		ms	~

Test Solution Preparation: Test Solution Prepared For Both Species.

Treatment	Effluent	Dilution	Test		Upstream	Effluent	Synthetic
(% Effluent)	(mL)	(mL)	Day	Initials	Sample #	Sample #	Batch #
Lab Control	0	1200	0	ON	1		97-19
Control - Upstream	0	1200	1	RWM	1		97-18
6%	72	1128	2	pu	- 1	2	97-18
13%	156	1044	3	Per	Ţ	7	97-18
25%	300	900	4 4	V Pour		2	97-15
50%	600	600	5	Pu	1		9718
100%	1200	0	6	my	1	3	97-18
			7	/			

Pimephales promelas - Chronic Toxicity Test Water Quality Data

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

121318-9

						Disso	lved Ox		ng/L)					
	- 79	48			*	4		ay		14	.45	-	ACRES OF THE PARTY.	-
Meter#	9	3	5	3			5	5			5	3	3	5
Treatment	0				2		3	F	4	F	-	F	,	F
(% Effluent)		F		F	- ^	F 4 400		F	0	lall	0.1		8.2	7,5
Lab Control	8.3	104	8.3	way	973	Co-0	8.5	7	8.5	/ 1	84	5.7	8-1	
Control - Upstream	84	701	8.6	625	84	5.8	86	73	0 4	Coll		6.4	<u>'</u>	7.7
6%	96,4	70	8.	6.2	SIL	5.6	816	72	8.6		824	6.0	8.0	7.1
13%	8.4	70	8.4	1015	84	1.8	86	7.0	8,7	Con	8.4	8.8	8.0	73
25%	8.5	lar9	14	6.5	gy.	5.9	80	7.0	8/7	Could	83	57.9	8.0	6,2
50%	8.5	71	D.Y	Ce-7	84	5.9	86	7.1	8.1	1253	83	54	7-9	6.4
100%	8.5	70	8.4	Git	815	5.6	876	3.0	87	62	813	5.9	7. 7	Cost
					,		bu Ç	S.U.)						
Meter#	8	10	8	10	8	10	8	8	8	10	10	10	8	8
Treatment	0	'	1 -2.		2		3		4		5		6	7
(% Effluent)	1	F		F		F	ı.l	F		F		F		F
Lab Control	7.8	7.4	7.9	76	7.9	7-8	80	7.5	7.8	Fill	18	7. 2	7.8	7.5
Control - Upstream	710	48	7.9	76	79	810	MA	7.8	7.4	Je!	73	7.5	7.6	7.6
6%		28		26		80	49	7.8		71		7.8		76
13%	1 3-0	78		79		200		7.8		73		7,6		7.6
25%		78		77		80		7.8		78		7.6		75
50%		1.8		77		80		フィフ	24	77	4.0	7.6		76
100%	7.7	1.8	7.7	77	78	19	77	7.7	7.6	127	20	7.6	7.7	7.5
						Cand	ويحاسفه مثلات ويا							
						Cond		(umhos		my In	100	W-1.5		
Motor #	T /					and		ay / j		PM		W2/18		l
Meter#					2	21/	D	ay Anh	6				 	!
Treatment	0		1		2	12/5		ay Aniv			5		6	7
Treatment (% Effluent)	Ī	F		F-7	191	F	D	ay An	6 4	 F				!
Treatment (% Effluent) Lab Control	32	F	329	F -7	191	F	D 3 3	F 324	4 324	 F			328	7 F
Treatment (% Effluent) Lab Control Control - Upstream	324	F	329 331	F -2	327	F	D 3 1 1 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	F 327	6 4 324 332	 F	5 - 335 (F 752-	328	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6%	1 32 -229 -354	F	324 331 536	F '	291 327 338	F	D 3 3 1 3234 3245	F 32-4 32-	6 4 324 332 33 9	 F 	5 - 341		328	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13%	1 32 329 334 340	F	329 331 536 342	F -7	291 327 328 349	F	D 3 1 3245 345 345	F 32.4 124- 135-	6 4 324 332 339 348		5 327 327 347 3403	F 752-	328 331 340 353	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25%	1 326 -329 -354 -340 -351	F	329 331 336 342 353	F -7	291 244 327 338 347 362	F	3 3 3 323 345 345 345	F 32-4 32-	6 4 324 332 33 9	 F 	5 325 325 346 346	F 354 331- 472-	328 331 340 353	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50%	-329 -329 -334 -340 -351 -370	F	329 331 331 342 372 372	F -7	291 324 324 338 347 362 396	F	3 3 3 345 345 345 345 361 361	F 32.4 124- 135-	5 324 332 339 348 47 345		5 347 347 340 346 346 348	F 354 331- 472-	328 331 340 353 370 409	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25%	1 326 -329 -354 -340 -351	F	329 331 336 342 353	F -7	291 244 327 338 347 362	F	3 3 3 345 345 36 36 36 36 36 36 36 36 36 36 36 36 36	F 32.7	5 4 324 332 339 348 44 363 458	 F 	5 325 325 346 346	F 354 331- 472-	328 331 340 353	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50%	-329 -329 -334 -340 -351 -370	F	329 331 331 342 372 372	F	291 324 324 338 347 362 396	F	D 33 1 345 345 345 310 363 465 empera	F 32.7	5 4 324 332 339 348 44 363 458	F	5 347 347 340 346 346 348	F 354 331- 472-	328 331 340 353 370 409	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50%	-329 -329 -334 -340 -351 -370	F	329 331 331 342 372 372	F -7	234 324 328 349 349 362 396 458	F	D 33 3 345 345 345 345 455 empera	F 37.7 17.7 17.7 17.7 17.7 17.7 17.7 17.7	6 4 4 324 334 348 348 348 347 345 450	F	347 347 347 316 366 388 416	F 752 331-	328 331 340 353 370 409 487	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment	-329 -329 -334 -340 -351 -370	F	329 331 331 342 372 372	F	291 324 324 338 347 362 396	F	D 33 1 345 345 345 310 363 465 empera	F 37.4 12.4 13.5 ture (° (ay	5 4 324 332 339 348 44 363 458	F	5 347 347 340 346 346 348	F 752 331- 472- 51- 	328 331 340 353 370 409	7 F 7
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent)	1 324 329 354 340 351 370 4(1	F	331 331 331 336 342 353 372 414	F -2	241 324 324 328 349 349 346 458	F	D 33 1 345 345 345 345 455 empera D 3 1	F 37.4 12.4 13.5	6 4 4 524 532 532 545 758	F F	347 347 346 366 366 366 366 365 365	F 752-31-472- 51	328 331 340 373 370 409 477	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent) Lab Control	1 324 329 359 340 351 370 4(1	F	324 331 331 342 353 372 414	F - 7	291 324 324 348 348 346 458 458	F	D 1 33 1 345 345 345 345 455 empera D 3 1 2 M	F 37.7 17.7 17.7 17.7 17.7 17.7 17.7 17.7	6 4 4 324 334 339 348 44 124	F	55 347 346 346 346 348 410	F 331- 472- 51- F 27	328 328 331 340 370 409 488 56	7 F -
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent)	1 324 329 354 340 351 370 4(1	F	324 331 331 342 353 372 414	F 7	291 327 327 347 347 360 458 458	F 	D 1 33 1 345 345 345 345 455 empera	ay / 1 F 37.7 1.7	6 4 4 324 334 348 348 348 455 455 4 1 24 24	F	55 347 346 346 348 41d	F 331- 472- 51 F 27 24	328 328 331 340 373 370 409 488 6	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent) Lab Control Control - Upstream 6%	1 324 329 354 340 351 370 4(1	F	324 331 331 342 353 372 414 414 24 24 24	F 7	291 237 327 347 347 360 458 458	F	D 1 33 1 345 345 345 345 455 empera	F 37.7 17.7 17.7 17.7 17.7 17.7 17.7 17.7	6 4 4 324 332 339 349 349 345 450 1 24 24 24	F	55 347 346 346 348 41d	F 752 31- 472- 51 27 24	328 328 331 340 370 409 488 56	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent) Lab Control Control - Upstream 6% 13%	1 324 329 354 340 351 370 411	F	324 331 331 336 372 353 372 414 414 24 24 24 24	F 1	291 324 324 349 349 346 458 458 2 1 2 1 24 24 24	F	D 33 1 345 345 345 345 345 5 3 1 24 5 3 3 1 25 3 3 1 25 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	F 37.7 17.	6 4 4 324 332 339 349 349 450 1 24 24 24 24 24	F	55 - 347 - 3163 - 3163 - 3188 - 4160 - 4188 - 4188 - 4160 - 4188	F 331- 31- 31- 27 24 24	328 331 340 353 370 409 488	7 F
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25%	1 324 329 351 340 351 370 4(1)	F	324 331 331 342 353 372 414 414 24 24 24 24 24	F 25 W 75 25 25	291 324 324 349 340 346 458 2 1 25 24 24 24 24 24	F	D 33 1 345 345 345 345 345 5 3 1 24 5 3 3 1 25 3 3 1 25 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	ay / 1 F 37.4 124 145	6 4 4 324 334 338 348 348 4750 150 150 150 150 150 150 150 1	F	5 - 347 346 346 348 41d	F 331- 472- 51 27 24 24 24	328 328 331 340 370 409 488 6	7 F -
Treatment (% Effluent) Lab Control Control - Upstream 6% 13% 25% 50% 100% Meter # Treatment (% Effluent) Lab Control Control - Upstream 6% 13%	1 324 329 354 340 351 370 411	F	324 331 331 336 372 353 372 414 414 24 24 24 24	F 1	291 324 324 349 349 346 458 458 2 1 2 1 24 24 24	F	D 1 3 3 1 3 45 3 45 5 3 1 1 2 4 5 5 1 5 5	F 37.7 17.	6 4 4 324 332 339 349 349 450 1 24 24 24 24 24	F	55 - 347 - 3163 - 3163 - 3188 - 4160 - 4188 - 4188 - 4160 - 4188	F 331- 31- 31- 27 24 24	328 331 340 353 370 409 488	7 F

Note: D.O. meter also used for temperature measurement unless otherwise noted.

Environmental Resources Management

Pimephales promelas - Chronic Toxicity Test Survival Data

Table 3 Page 1 of 2

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

(F

121318-9

Treatment				# L	ive C								# L	ive O		sms			48 Hou	r Surviv	al Summary
(% Effluent)	Don	0	4	2	1 0	Day	_						_	_	ay				Tota	al Live	%
Lab Control	Rep.		- Birm	2	3	4	5	6	7	Rep.	0	1	2	3	4	5	6	7	Initial	Final	Surviva
Control - Upstream	A	10	10	00	[0	10	D	10	7	В	10	0	10	0	0	(0	10	10	40	40	100
6%	A	10	10	0	W	10	NO	10	10	В	10	10	(0	10	10	0	10	16	40	39	97.5
13%	A	10	7.00	10	10	10	10	10	10	В	10	10	10	10	10	10	6	10	40	39	97.5
25%	A	10	10	10	10	10	10	10	10	В	10	10	10	D	10	10	6	10	40	40	100
50%	A	10	10	10	P	10	P	10	10	В	10	10	TO	10	10	(0)	10	10	40	40	135
100%	Â	10	W.	10	10	10	10	10	10	В	10	10	(0	10	10	0	10	10	40	40	100
10070	^	10	IU.	LIP.	LID	10	ID	10	10	В	10	10	10	0	9	a	9	9	40	40	100
					# Live	Org	anisn Day 🌡	nsl, c	/		-	1.	# Li	ve O	rganis	sms	_	- 1	7 Day	Surviva	Summary
Treatment						[Day D	MIC	,	-	- Pi	2/14		Di						Live	%
(% Effluent)	Rep.	0	1	2	3	4	5	6	7	Rep.	0	1	2	3	4	5	6	7	Initial		Survival
			71)	10	10	10	10	10	9	D	10	10.	105	lo	10	10	10	9	40	35	87.5
Lab Control	С	10	W	TV.	1,0	10					101							1 1	70 1		0143
Lab Control Control - Upstream	C	10	10	10	10		10	10	-		_	99	3		1	0		a	40		
		_	1	1		10	10		10	D	10	99	9	9	4	9	8	9	40	36	95
Control - Upstream	С	10	10	(0)	10	10		10	10	D D	10 10	99	9	9	5	9	8	8	40	346 346	95 95
Control - Upstream 6%	C C	10 10	000	(0)	10	10	10 XIC	10 10	10 10 10	D D D	10 10 10	99	9 00	9	50	990	8 10	B 10	40 40	3% 3% 40	95 95 100
Control - Upstream 6% 13%	C C	10 10 10	10	000	10	10	OKK	10	10	D D	10 10	99	900	9	5	9	8	8	40	36 36 40 39	95 95

Test Information:

	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Time:	1190	1730	1230	1100	1400	1500	1300	1100
nitials:	M	The	Ru	chr	Ms	2	ms	1
Date:	12/13/10	12/14/18	12/5/18	121618	12/12/18	10/0/0		12/20/

Comment Section:

ms	- 1	Lan

Day	Date	Initials	Comments
	1		
	-		

Environmental Resources Management

Pimephales promelas - Chronic Toxicity Test Growth Data

Table 3 Page 2 of 2

Permittee/Client:

Tonawanda Coke Corp.

Effluent/Location:

Outfall 004

Lab I.D.#:

121318-9

			Final	Initial	Larvae	# of	Avg. Wt./ Organism/	Avg. Wt./ Organism/	Avg. Wt./ Organism
Pan	Conc.	Replicate	Weight	Weight	Weight	Initial	Replicate	Treatment	Treatmen
#	(% Effluent)		(mg)	(mg)	(mg)	Organisms	(mg)	(mg)	% CV
Date	(70 Emilione)		12/21/18	12/17/18	(,,,9)		(3/		
Analyst			km	km					
1	Lab Control	Α	20.01	15.13	4.88	10	0.488		
2	Lab Control	В	20.76	14.71	6.05	10	0.605		
3	Lab Control	С	17.82	12.09	5.73	10	0.573		
4	Lab Control	D	25.14	18.92	6.22	10	0.622	0.572	10.4
5.	bntrol - Upstred	Α	29.62	22.30	7.32	10	0.732		
6	ontrol - Upstrea	В	26.30	20.76	5.54	10	0.554		
7	ontrol - Upstrea	С	31.45	25.92	5.53	10	0.553		
8	ontrol - Upstrea	D	28.01	22.53	5.48	10	0.548	0.597	15.1
9	6%	Α	26.45	20.60	5.85	10	0.585		
10	6%	В	25.45	18.54	6.91	10	0.691		
11	6%	С	30.04	22.72	7.32	10	0.732		
12	6%	D	25.79	21.13	4.66	10	0.466	0.619	19.2
13	13%	Α	23.89	18.49	5.40	10	0.540		
14	13%	В	22.34	17.39	4.95	10	0.495		
15	13%	С	25.40	18.95	6.45	10	0.645		
16	13%	D	23.28	16.82	6.46	10	0.646	0.582	13.1
17	25%	Α	24.29	18.46	5.83	10	0.583		
18	25%	В	24.79	18.80	5.99	10	0.599		
19	25%	С	27.09	20.86	6.23	10	0.623		
20	25%	D	23.37	17.97	5.40	10	0.540	0.586	6.0
21	50%	Α	23.35	16.46	6.89	10	0.689		
22	50%	В	22.64	16.43	6.21	10	0.621		
23	50%	С	22.19	16.02	6.17	10	0.617		
24	50%	D	26.94	21.20	5.74	10	0.574	0.625	7.6
21	100%	A	23.03	16.91	6.12	10	0.612		
22	100%	В	22.31	17.22	5.09	10	0.509		
23	100%	C	23.96	17.39	6.57	10	0.657		
24	100%	D	23.87	17.55	6.32	10	0.632	0.603	10.8

≀uality A	ssurance	and distance of the state of th			Final Wt. (mg)
25	Blank	Α	10.57	10.57	0.00
26	Blank	В	11.33	11.29	0.04

Report Date: Test Code/ID: 21 Dec-18 13:15 (p 1 of 2) 45748A93 / 11-6526-5555

rathead with	10W /-	d Larval Si	urvivai an	d Growth	lest							ERN
Analysis ID: Analyzed:		34-4721 c-18 13:14		•	Mean Dry Biom Parametric-Cor	_	tments		IS Versio us Level:		.9.4	
Batch ID:	20-54	76-8077	Tes	t Type: 0	Growth-Surviva	l (7d)		Anal	yst: L	ab Tech		
Start Date:	13 De	c-18 11:00			EPA/821/R-02-			Dilue	ent: R	eceiving Wate	r	
Ending Date:	20 De	c-18 11:00	Spe	ecies: F	Pimephales pro	melas		Brine	e:			
Test Length:				con:	Actinopterygii			Sour	rce: Ir	n-House Cultur	е	Age: <2
Sample ID:	10-45	07-0296	Co	de: 3	3E4A81D8			Proje	ect: V	VET Compliand	ce Testing	
Sample Date:	: 12 De	c-18 09:25	Ma	terial: 1	ndustrial Efflue	ent		Sour	rce: T	onawanda Cok	ce Corp.	
Receipt Date:	: 13 De	c-18 10:00	CA	S (PC):				Stati	on: C	outfall 004		
Sample Age:	26h (2	2 °C)	Clie	ent:	Fonawanda Co	ke Corp.						
Data Transfo	rm		Alt Hyp					NOEL	LOEL	TOEL	TU	PMSD
Untransforme	d		C > T					100	>100	n/a	1	22.04%
Dunnett Mult	iple Co	mparison	Test									
Control	vs	Conc-%		Test St	at Critical	MSD DF	P-Type	P-Value	Decisio	on(α:5%)		
Upstream Cor	ntr	6		-0.3981	2.407	0.132 6	CDF	0.9242		gnificant Effect		
		13		0.2792	2.407	0.132 6	CDF	0.7383		gnificant Effect		
		25		0.1922	2.407	0.132 6	CDF	0.7705		gnificant Effect		
		50		-0.5217		0.132 6	CDF	0.9425		gnificant Effect		
		100		-0.1053	2.407	0.132 6	CDF	0.8624	Non-Si	gnificant Effect		
Test Accepta	bility C	riteria	TAC	.imits								
Attribute		Test Stat	Lower	Upper	Overlap	Decision						
Control Resp		0.5968	0.25	>>	Yes	Passes C	riteria					
ANOVA Table)											
Source		Sum Squa		Mean S		DF	F Stat	P-Value		on(α:5%)		
Between		0.0060347		0.00120		5	0.2022	0.9573	Non-Si	gnificant Effect	t	
Error		0.107437		0.00596	687	18	_					
Total		0.113472				23						
Distributiona	l Tests											
Attribute		Test				Test Stat	Critical	P-Value	Decision	on(α:1%)		
Variances		Bartlett Eq	uality of V	ariance Te	st	4.67	15.09	0.4575	Equal \	/ariances		
Distribution		Shapiro-W	ilk W Norn	nality Test		0.98	0.884	0.8958	Norma	Distribution		
Mean Dry Bio	mass-	mg Summ	ary									
Conc-%		Code	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0		U	4	0.5968	0.4532	0.7403	0.5535	0.548	0.732	0.0451	15.12%	0.00%
6			4	0.6185	0.4291	0.8079	0.638	0.466	0.732	0.05952	19.25%	-3.64%
13			4	0.5815	0.4603	0.7027	0.5925	0.495	0.646	0.03808	13.10%	2.56%
			4	0.5863	0.5307	0.6418	0.591	0.54	0.623	0.01747	5.96%	1.76%
25			4	0.6253	0.5496	0.7009	0.619	0.574	0.689	0.02376	7.60%	-4.78%
			4	0.6025	0.4991	0.7059	0.622	0.509	0.657	0.0325	10.79%	-0.96%
50												
50 100	omass.	mg Detail										
50 100 Mean Dry Bio Conc-%		Code	Rep 1	Rep 2	Rep 3	Rep 4						
50 100 Mean Dry Bio Conc-% 0		100	Rep 1 0.732	0.554	0.553	0.548						
50 100 Mean Dry Bio Conc-% 0 6		Code	Rep 1 0.732 0.585	0.554 0.691	0.553 0.732	0.548 0.466						
50 100 Mean Dry Bio Conc-% 0 6 13		Code	Rep 1 0.732 0.585 0.54	0.554 0.691 0.495	0.553 0.732 0.645	0.548 0.466 0.646						
50 100 Mean Dry Bio Conc-% 0 6 13		Code	Rep 1 0.732 0.585	0.554 0.691 0.495 0.599	0.553 0.732 0.645 0.623	0.548 0.466						
25 50 100 Mean Dry Bio Conc-% 0 6 13 25 50		Code	Rep 1 0.732 0.585 0.54	0.554 0.691 0.495	0.553 0.732 0.645	0.548 0.466 0.646						

Report Date: Test Code/ID: 21 Dec-18 13:15 (p 2 of 2) 45748A93 / 11-6526-5555

Fathead Minnow 7-d Larval Survival and Growth Test

ERM

Analyzed:

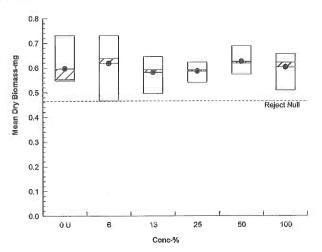
Analysis ID: 11-7334-4721 21 Dec-18 13:14 Analysis:

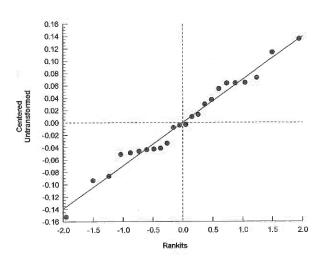
Endpoint: Mean Dry Biomass-mg Parametric-Control vs Treatments **CETIS Version:**

CETISv1.9.4

Status Level:

Graphics





Report Date: Test Code/ID: 21 Dec-18 13:15 (p 1 of 2) 45748A93 / 11-6526-5555

Sample Dr. 10-4507-0296 Cole 3EA81D8 Sample Dr. 12 Dec-18 09:25 Material Industrial Effluent Source Source Tonawanda Coke Corp. Station	Fathea	d Minn	ow 7-d Larval St	irvival and	Growt	h Test							ERM
Start Disc 20-5476-8077 Test Type Growth-Survival (7d) Analyst: Lab Tech Receiving Water Start Date: 3 Dec-18 11:00 Protocol: EPA/82/14-02-013 (2002) Dituent: Receiving Water Receivi	Analysi	is ID:	01-3367-2131	End	point:	Mean Dry Bion	nass-mg		CET	IS Version:	CETIS	/1.9.4	
Start Date: 13 Dec-16 11:00	Analyz	ed:	21 Dec-18 13:14	Ana	lysis:	Linear Interpol	ation (ICPIN))	Stat	us Level:	1		
Sample Date 20 Dec-18 11:00 Species Prime phales promeias Brine Source	Batch I	D:	20-5476-8077	Test	Type:	Growth-Surviva	al (7d)		Ana	lyst: Lab	Tech		
Case Length Fig. 10 45 07 40 0	Start D	ate:	13 Dec-18 11:00	Prot	ocol:	EPA/821/R-02	-013 (2002)		Dilu	ent: Red	ceiving Wa	ter	
Sample Date 10-4507-0296 Code 3E4A8 1B8 Froject WET Compliance Testing Sample Date 12 Dec-18 10-905 Material Industrial Effluent Source Tonawanda Coke Corp. Station Outfail Ook Source Station Outfail Ook Outfail Ook Source Station Outfail Ook Source Station Outfail Ook Outfail O	Ending	Date:	20 Dec-18 11:00	Spe	cies:	Pimephales pr	omelas		Brin	e:			
Material Industrial Effluent Source Tonawanda Coke Corp. Station Court	Test Le	ngth:	7d 0h	Taxo	on:	Actinopterygii			Sou	rce: In-l	House Cult	ure	Age: <24
Case Paris 13 Dec 18 10:00 Case PC Cilient: Tonawanda Coke Corp. Station: Outfall 004 Station: Outfall 004 Station: Outfall 004 Station: Outfall 004 Station:	Sample	D:	10-4507-0296	Cod	e:	3E4A81D8			Proj	ect: WE	T Complia	nce Testing	
Caransion Age 28h (2 °C) Cilent Tonawanda Coke Corp.	Sample	Date:	12 Dec-18 09:25	Mate	erial:	Industrial Efflu	ent		Sou	rce: Tor	nawanda C	oke Corp.	
Control Response Control Res	Receip	t Date:	13 Dec-18 10:00	CAS	(PC):				Stat	ion: Out	tfall 004		
Control Fine	Sample	Age:	26h (2 °C)	Clie	nt:	Tonawanda Co	oke Corp.						
Cogno Cogn	Linear	Interpo	olation Options										
Tack Control Rest Control Rest Control Rest Control Rest Control Rest Control Rest Rest Control Rest Rest Control Rest Rest Control Rest	X Trans	sform	Y Transform	See	d	Resamples	Exp 95%	CL Met	hod				
Note Past	Log(X+	1)	Linear	6916	684	200	Yes	Two	-Point Interp	oolation			
Note Past	Test Ac	ceptal	oility Criteria	TACL	Imito								
Point Estimates		_				r Overlap	Decision						
Note			0.5968				Passes C	riteria					
Note	Point E	stimat	es		· · · · · · · · · · · · · · · · · · ·								
C5 > 100				95% UCL	TU	95% LCL	95% UCL						-
C15 > 100	IC5			n/a		n/a	n/a						Access to the second se
C20	IC10	>100	n/a	n/a	<1	n/a	n/a						
C25 > 100 n/a n/a n/a < 1 n/a n/a n/a	IC15	>100	n/a	n/a	<1	n/a	n/a						
C40 >100 n/a n/a n/a <1 n/a n/a n/a n/a n/a n/a n/a	IC20	>100	n/a	n/a	<1	n/a	n/a						
C50 >100 n/a n/a	IC25	>100	n/a	n/a	<1	n/a	n/a						
Conc-% Code Count Mean Min Max Std Dev CV% %Effect Mean %Effect Mean %Effect Mean %Effect Mean %Effect Mean %Effect	IC40	>100	n/a	n/a	<1	n/a	n/a						
Conc-% Code Count Mean Min Max Std Dev CV% %Effect Mean %Effect 0 U 4 0.5968 0.548 0.732 0.0902 15.12% 0.0% 0.6076 0.0% 6 4 0.6185 0.466 0.732 0.119 19.25% -3.65% 0.6076 0.0% 13 4 0.5815 0.495 0.646 0.07615 13.10% 2.56% 0.5989 1.44% 25 4 0.5863 0.54 0.623 0.03494 5.96% 1.76% 0.5989 1.44% 100 4 0.6253 0.574 0.689 0.04753 7.60% -4.78% 0.5989 1.44% Mean Dry Biomass-mg Detail Conc-% Code Rep 1 Rep 2 Rep 3 Rep 4 -0.54 0.588 0.548 -0.548 -0.548 -0.548 -0.548 -0.646 -0.646 -0.646 -0.646 -0.646 -0.646 -0.6	IC50	>100	n/a	n/a	<1	n/a	n/a						
U 4 0.5968 0.548 0.732 0.0902 15.12% 0.0% 0.6076 0.0% 6.6 0.0% 4 0.6185 0.466 0.732 0.119 19.25% -3.65% 0.6076 0.0% 13 4 0.5815 0.495 0.646 0.07615 13.10% 2.56% 0.5989 1.44% 0.5863 0.54 0.623 0.03494 5.96% 1.76% 0.5989 1.44% 0.6253 0.574 0.689 0.04753 7.60% -4.78% 0.5989 1.44% 0.6000 4 0.6025 0.509 0.657 0.06499 10.79% -0.96% 0.5989 1.44% 0.6000 U 0.732 0.554 0.553 0.548 0.585 0.691 0.732 0.466 0.585 0.594 0.495 0.645 0.646 0.586 0.598 0.621 0.598 0.621 0.574 0.689 0.574	Mean D	ry Bio	mass-mg Summ	ary			Cal	Iculated Va	ariate			Isoton	ic Variate
U 4 0.5968 0.548 0.732 0.0902 15.12% 0.0% 0.6076 0.0% 6.6076 0.0% 4 0.6185 0.466 0.732 0.119 19.25% -3.65% 0.6076 0.0% 13 4 0.5815 0.495 0.646 0.07615 13.10% 2.56% 0.5989 1.44% 1.25 4 0.5863 0.54 0.623 0.03494 5.96% 1.76% 0.5989 1.44% 1.00 4 0.6025 0.509 0.657 0.06499 10.79% -0.96% 0.5989 1.44% 1.00 U 0.732 0.554 0.553 0.548 0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.645 0.646 0.5863 0.599 0.623 0.594 0.657 0.574 0.689 0.646 0.07615 13.10% 0.5989 1.44% 1.49% 1.25 1.25 1.25 1.25 1.25 1.25 1.25 1.25	Conc-%	6	Code	Count	Mean	Min	Max	Std Dev	CV%	%Effect		Mean	%Effect
13	0		U	4	0.596	8 0.548	0.732	0.0902	15.12%	0.0%		0.6076	0.0%
25 4 0.5863 0.54 0.623 0.03494 5.96% 1.76% 0.5989 1.44% 5.00 4 0.6253 0.574 0.689 0.04753 7.60% -4.78% 0.5989 1.44% 100 4 0.6025 0.509 0.657 0.06499 10.79% -0.96% 0.5989 1.44% 1.44	6			4	0.618	5 0.466	0.732	0.119	19.25%	-3.65%		0.6076	0.0%
50	13			4	0.581	5 0.495	0.646	0.07615	13.10%	2.56%		0.5989	1.44%
Mean Dry Biomass-mg Detail Conc-% Code Rep 1 Rep 2 Rep 3 Rep 4 0 U 0.732 0.554 0.553 0.548 0 0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	25			4	0.586	3 0.54	0.623	0.03494	5.96%	1.76%		0.5989	1.44%
Mean Dry Biomass-mg Detail Conc-% Code Rep 1 Rep 2 Rep 3 Rep 4 0 U 0.732 0.554 0.553 0.548 0 0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	50			4	0.625	3 0.574	0.689	0.04753	7.60%	-4.78%		0.5989	1.44%
Conc-% Code Rep 1 Rep 2 Rep 3 Rep 4 0 U 0.732 0.554 0.553 0.548 3 0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	100			4	0.602	5 0.509	0.657	0.06499	10.79%	-0.96%		0.5989	1.44%
0 U 0.732 0.554 0.553 0.548 3 0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	Mean D	ry Bio	mass-mg Detail										
0.585 0.691 0.732 0.466 13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	Conc-9	6	Code	Rep 1	Rep 2	Rep 3	Rep 4						
13 0.54 0.495 0.645 0.646 25 0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	0		U	0.732	0.554	0.553	0.548						
0.583 0.599 0.623 0.54 50 0.689 0.621 0.617 0.574	6			0.585	0.691	0.732	0.466						
0.689 0.621 0.617 0.574	13			0.54	0.495	0.645	0.646						
0.689 0.621 0.617 0.574	25			0.583	0.599	0.623	0.54						
	50			0.689			0.574						
	100			0.612			0.632						

Report Date:

21 Dec-18 13:15 (p 2 of 2)

Test Code/ID:

45748A93 / 11-6526-5555

Fathead	Minnow 7-	d Larval	Survivat	and	Growth	Test
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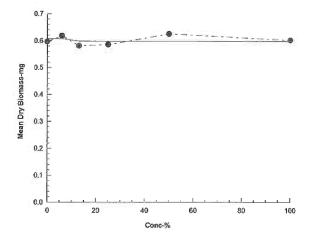
EDM

Analysis ID: Analyzed:

01-3367-2131 21 Dec-18 13:14 Endpoint: Analysis:

Mean Dry Biomass-mg Linear Interpolation (ICPIN) CETIS Version: Status Level: CETISv1.9.4

Graphics



USEPA

DateShipped: 12/12/2018

CarrierName: FedEx

AirbillNo: 773951939200

CHAIN OF CUSTODY RECORD

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132004-0013

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Lab#	Sample #	Location	Analyses	Matrix	Sample	Sample	Numb	Numb Container Cont	Preservative Lab QC	Lab QC
	OF4-01-181212-01	OUTFALL 4	Chronic Toxicity Test	Water	12/12/2018	09:25	1	10 L Nalgene	None	z
						Į.				
	1000		- Control of the							
	P-812101									
	0,7,1									
	100									
	12.70	16								
	20408									
	10									
1										
1										

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013 Daphnid - Method 1002.0

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY#

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

		į	Contraction Characteristics of the Landers	Contract Con
tems/Reason	Relinquished by (Signature and Organization)	Date/ Ime	Received by (Signature and Organization)	Date/ I Imega Sarripre Condition Opon Receipt
٧	MESTOWN	1/1/18 150	posts/ my	12/2/18
			The state of the s	

USEPA

DateShipped: 12/14/2018

CarrierName: FedEx

AirbillNo: 773975881367

CHAIN OF CUSTODY RECORD

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121418-114000-0018

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Lab # Sample #	Location	Analyses	Matrix	Sample Date	Sample Time	Numb	Numb Container Cont	Preservative Lab QC	Lab QC
OF4-02-181214-01 OUTFALL 4	OUTFALL 4	Chronic Toxicity Test	Water	12/14/2018	08:25	-	10 L Nalgene	4 C	z
	t-818/21								
	Oct. 100								
	Do. 128								
	Town !								
	しゃい かんり								
						1 2	100	100	

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

Items/Reason	Items/Reason Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Date/Time Sample Condition Upon Receipt
1/5 simple	WESTON	1500	Fedex		/
			Collon Ballton	18/18/100	Cold
			20	9 7	_

DateShipped: 12/17/2018 USEPA

CarrierName: FedEx

AirbillNo: 77399646440

CHAIN OF CUSTODY RECORD

Case #:

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121718-114628-0019 Cooler#: 1 Lab: Environmental Resources Management

Lab Phone: 616-399-3500

一名 本	Sample #	Location	Analyses	Matrix	Sample	Sample	Cont	Numb Container Cont	Preservative Lab QC	Lab OC
	OF4-03-181217-01 OUTFALL 4	OUTFALL 4	Chronic Toxicity Test	Water	12/17/2018	11:40	1	10 L Nalgene	4C	z
	121918-7									
	ついっており									
	00: 12.00									
	Tamo? 2									
	Conditules									
				And Committee of the Co						

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013 Daphnid - Method 1002.0

48 Hour Prelim Results, Two weeks written. Email Results to Fathead Minnow - Methd 1000.0

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY#

ems/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	nd Organization)	Date/Time	Sample Condition Upon Receipt
	TESTON	19/13/18	To de X			
			Colleur Ro	galleran	12/18/18 1030	* out of hold knee
						Feder Gronthand

01/8/2121

CHAIN OF CUSTODY RECORD

DateShipped: 12/12/2018

Page 1 of 1 USEPA CarrierName: FedEx

AirbillNo: 773951939439

Fab #

Contact Name: Tim Benton

No: 2-121218-132541-0014

Lab: Environmental Resources

Lab Phone: 616-399-3500

Contact Phone: (732) 585-4425

Preservative Lab QC None 10 L. Nalgene Numb Container Cont Sample Time 10:40 12/12/2018 Sample Date Matrix Water Analyses None NIAGARA RIVER 121518 Location OWN PUST RW-01-181212 200 FOR T Sample #

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Tim.Benton@WestonSolutions.com and Patrick.Buster@WestonSolutions.com

SAMPLES TRANSFERRED FROM CHAIN OF CUSTODY #

titon) Date/Time Sample Condition Upon Receipt	12/13/18	
Received by (Signature and Organization)	Par Islam	
Date/Time	12/12/10 1500	
Relinquished by (Signature and Organization)	LESTON LESTON	
Items/Reason	Nample .	

121318-18 11 21/13

CHAIN OF CUSTODY RECORD

Case #:

DateShipped: 12/12/2018

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AirbillNo: 773951939987 CarrierName: FedEx

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132710-0015 Cooler #: 3 Lab: Environmental Resources Management

Lab Phone: 616-399-3500

Location	Analyses	Matrix	Sample	Sample	Numb	Numb Container Cont	Preservative Lab QC	Lab OC
NIAGARA RIVER	None	Water	12/12/2018	10:41	1-	10 L Nalgene	None	z
					- 1			
Vi								
					Ш			
1								

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (§ignature and Organization)	Date/Time	Sample Condition Upon Receipt
Sande.	TO MODE	12/14/18 1500	Mesal Nesan	1000)	
		45			

121318 - 1612 = 1213

DateShipped: 12/12/2018

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AirbillNo: 773951940270 CarrierName: FedEx

Contact Name: Tim Benton

Contact Phone: (732) 585-4425

No: 2-121218-132805-0016 Cooler #:4

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

None

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013

SAMPLES TRANSFERRED FROM

CHAIN OF CUSTODY #

Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

Items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
y Sample	TA WESTON	12/2/19, 1500	An year	8/10/1/51	

121318-12/13 8/413

DateShipped: 12/12/2018

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AirbillNo: 773951940215 CarrierName: FedEx

CHAIN OF CUSTODY RECORD

Contact Phone: (732) 585-4425 Contact Name: Tim Benton

No: 2-121218-132857-0017

Lab: Environmental Resources Management

Lab Phone: 616-399-3500

e Lab QC	z									ST.
Preservative Lab QC	None		1							
Numb Container Cont	10 L Naigene									
Numb	-									
Sample	10:43					1				
Sample Date	12/12/2018									
Matrix	Water									
Analyses	None									
Location	NIAGARA RIVER									
Sample #	RW-04-181212									
Lab#										

Special Instructions: Chronic Toxicity Test - Method: EPA-821-R-02-013 Daphnid - Method 1002.0

Fathead Minnow - Methd 1000.0

48 Hour Prelim Results, Two weeks written. Email Results to

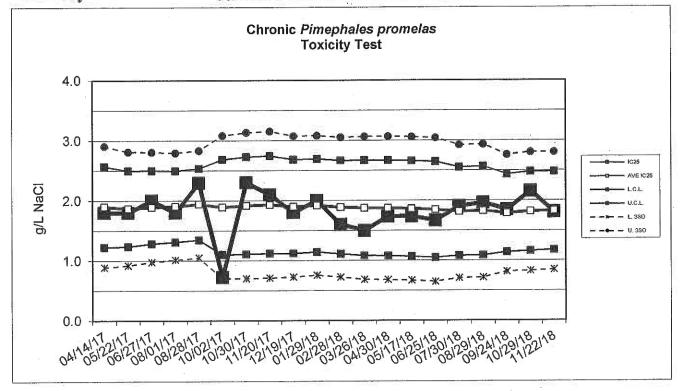
FERRED FROM	DY#		Comple Condition Linear Door
SAMPLES TRANSFERRED FROM	CHAIN OF CUSTODY #		Contraction C
			(action of the contract of the

items/Reason	Relinquished by (Signature and Organization)	Date/Time	Received by (Signature and Organization)	Date/Time	Sample Condition Upon Receipt
1/stude	T WESTON	12/12/18	Charles and Many	81/21/21	
			Madestrong management		



Environmental Resources Management

Standard Reference Toxicant Data



Chronic Pimephales promelas Toxicity	/ Test	Data
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		Omomo i	intepriares p		only root but	CONTROL	
Date	IC25	AVE IC25	CONTR	OL LIMIT	Survival	Growth	CV
	(g/L NaCl)	(g/L NaCl)	Lower	Upper	(%)	(mg)	(%)
				-			
04/14/17	1.8	1.9	1.2.	2.6	95	0.43	3.7
05/22/17	1.8	1.9	1.2	2.5	97.5	0.35	3.0
06/27/17	2.0	1.9	1.3	2.5	95	0.54	17.0
08/01/17	1.8	1.9	1.3	2.5	100	0.52	9.8
08/28/17	2.3	1.9	1.3	2.5	97.5	0.50	2.6
10/02/17	0.7	1.9	1.1	2.7	82.5	0.49	23.4
10/30/17	2.3	1.9	1.1	2.7	92.5	0.46	20.6
11/20/17	2.1	1.9	1.1	2.7	85	0.39	7.1
12/19/17	1.8	1.9	1.1	2.7	100	0.58	5.3
01/29/18	2.0	1.9	1.1	2.7	97.5	0.39	4.8
02/28/18	1.6	1.9	1.1	2.7	92.5	0.44	10.7
03/26/18	1.5	1.9	1.1	2.7	97.5	0.47	3.5
04/30/18	1.7	1.9	1.1	2.7	95	0.45	11.4
05/17/18	1.7	1.9	1.1	2.7	100	0.54	10.8
06/25/18	1.7	1.8	1.0	2.6	95	0.56	17.8
07/30/18	1.9	1.8	1.1	2.6	97.5	0.43	4.3
08/29/18	2.0	1.8	1.1	2.6	100	0.58	9.4
09/24/18	1.8	1.8	1.1	2.4	97.5	0.46	8.2
10/29/18	2.2	1.8	1.2	2.5	97.5	0.45	7.7
11/22/18	1.8	1.8	1.2	2.5	95	0.65	5.2